

12. INVENTORY AND MONITORING

“The time has arrived for us as a people to stop and take an inventory of our natural resources; to observe their rapid consumption and to devise means to prevent the unnecessary and wasteful use of the past and present. In no other way can the duty we owe to ourselves and to posterity be discharged.”¹⁷

12-1 Objectives

- ▶ Inventory Fort Richardson’s natural resources and regularly monitor resources that are important indicators of the following: overall ecosystem integrity, capability of lands to support the military mission, renewable product surpluses, status of imperiled species or communities, and other special interests.
- ▶ Provide the means to implement an adaptive management strategy by providing current and predictive natural resources information that will affect decision-making, a critical component of ecosystem management.
- ▶ Provide information that may affect force structuring and stationing decisions at Major Command (MACOM) and Department of Army (DA) levels.

12-2 General

Over the years, inventory and monitoring have been classified by individual programs (Fish and Wildlife, ITAM, Forestry, etc.) at Fort Richardson and elsewhere. As with the other aspects of natural resources management, such programmatic identification is being replaced with one inventory and monitoring program based on the management techniques themselves.

12-2a Inventory

Current, quantitative data forms the backbone of any resource management program. Inventory, as used here, can be thought of as an itemization of ecosystem components. Quantifying those components is also useful for comparison purposes. Early inventories emphasized game resources at Fort Richardson, especially moose and fish. In the 1980s, the research on ERF increased inventory activities, especially species associated with wetlands. Inventory work was also increased postwide in the mid-1990s, with the advent of LCTA surveys for plants, songbirds, and small mammals. Section 8 summarizes inventory activities to date.

12-2b Monitoring

Monitoring, as defined here, is a periodic check carried out to assess the condition and status of the natural environment. It is a key to understanding population trends (and absolute numbers if needed) of individual species or higher associations of species such as plant communities or entire ecosystems. Monitoring generally targets species with high economic or human use values, endangered species, and indicator species of overall ecosystem health. The LCTA program can be used to target very specific areas (special-use plots) or post-wide trends. Monitoring on Fort Richardson has emphasized moose, ERF species, and land condition trends.

¹⁷ Governor Edwin L. Norris, Montana, 1909.

12-3 Inventory and Monitoring of Soil and Flora

12-3a Floristic Inventories (Planning Level Surveys)

Post-wide planning level surveys constitute inventories for Fort Richardson. A number of planning level surveys have been completed and are listed below.

12-3a(1) Forest Inventory

Fort Richardson has typical boreal forests with relatively low stand diversity. Due to the low commercial potential of Fort Richardson's forests, an intensive forest inventory is not planned for 1998–2003. LCTA will be used for partial, incremental inventory of forests by supplementing traditional data collection with information on insect/disease damage, age, girth, and height of trees. Additional



Fort Richardson's boreal forest.

special use LCTA plots may also be sited in forests. Vegetation mapping will complement LCTA with information on vegetation density within stands.

The old growth forest survey (Section 12-3a(5)) will be incorporated with LCTA forest data. In addition, the NRCS will collect site index and plant community information (including forest community) to supplement the updated soil survey (Section 12-3a(6)). These three efforts will contribute to a useful forest inventory, especially considering intensive commercial harvest is not a management objective at this time.

12-3a(2) Floristic Surveys

A postwide floristic inventory (vascular plants and cryptogams) was done in the summer of 1994 (Lichvar and Racine, 1995). The post was divided into five floristic zones, which were subdivided into 39 vegetation types. A laminated specimen and traditional herbarium mount of all plant species found were provided for use as reference material, especially during LCTA surveys. (See Section 8-2a for more information).

A floristic inventory was conducted on Elmendorf AFB in 1982–1983 (Elmendorf AFB, 1994). This survey of a neighboring area will be useful for comparison purposes.

An ongoing part of the LCTA program is the updating of the plant collection as new species are found. There are no other general floristic surveys planned for 1998–2003 unless special circumstances dictate otherwise. If additional surveys become necessary, recommendations listed on pages 5–7 of the WES/CRREL study (Lichvar and Racine, 1995) will be strongly considered. No additional surveys for rare or endangered species are planned at this time.

12-3a(3) Wetlands Inventory

WES is developing a classification system for wetlands based on hydrogeomorphic features of vegetative communities. This delineation, combined with a functions and values analysis (also being done by WES), will be used to prepare a Wetlands Management Action Plan (see Appendix 1). No additional wetlands inventory or classification is anticipated during 1998–2003.

12-3a(4) Riparian Inventory

Healthy functioning riparian areas are crucial for maintaining water quality (compliance with Clean Water Act), conserving biodiversity and ecosystem integrity, and enhancing the military mission by providing realistic training environments. Section 13-5, Special Area Protection, identifies several riparian areas with special protection. USARAK, with assistance from BLM, will identify and assess proper function condition of its riparian areas on Fort Ri-

chardson during 1998-2003 and take appropriate steps to ensure their continued functionality. Three provisions likely to be imposed in riparian areas are: no damage to trees, no digging, and off-road vehicle use restricted to winter.

12-3a(5) Old Growth Study

As a result of a study conducted in 1995 by Miami University (Ohio), Fort Richardson's old growth forests have been quantitatively identified, characterized, and mapped. These forests have unique aesthetic, commercial, and ecological values. USARAK is interested in preserving and enhancing the biological diversity associated with its old growth forests. Further information on Fort Richardson's old growth forests can be found in Section 13-5a.

12-3a(6) Soil Survey

The 1979 soil survey (SCS, 1979) includes about 60 percent of Fort Richardson's area. Figure 7-5 shows results of this survey. Since then, field techniques have been improved, and the post has identified the need for a current survey covering 100 percent of the post.

To that end, NRCS was contracted to conduct a soil and associated vegetation survey of the post in 1995-96. Work began in May 1995. An interim report was completed in 1997. This survey will include site index and plant community information.

12-3a(7) Remote Sensing

Aerial photographs and satellite images, by themselves, are not inventory items. They are, however, a very useful survey tool to persons interested in managing relatively large pieces of land or analyzing long term vegetation changes. USARAK has aerial photographs of much of the post at scales of 1:50,000, 1:25,000, and 1:12,500.

In August 1995, color infrared aerial photographs were taken at a 1:12,000 scale. Aerial photographs will be taken at regular intervals based on inventory and monitoring needs as well as land use changes. They will be used for all programs within the Natural Resources Branch. During 1998-2003, USARAK will investigate use of satellite imagery to enhance its ecosystem monitoring capabilities. Digital orthophotographs are necessary and will be

developed from aerial photographs and satellite imagery. They too will be used for all programs within Natural Resources Branch.

12-3a(8) Vegetative Mapping

USARAK is preparing a vegetation map using the services of the CEMML-CSU. The map is based on 1995 color infrared aerial photography and ground-truth data from the wetlands delineation, old growth forest study, and the LCTA program. This map will be completed in 1998 (Figure 12-3a(8)).

12-3a(9) Nutritional Value of Alpine Plants

In 1996 and 1997, a graduate student at the University of Alaska, Anchorage, conducted a study of the nutritional content of forage species of alpine plants with respect to species, elevation and aspect. This research is of practical importance in determining habitat quality for herbivores, including Dall sheep and mountain goats (*Oreamnos americanus*). It also



Dall sheep grazing on alpine vegetation near Site Summit.

has significant implications in the study of ecosystem response to global climate change. Results show a relationship between nitrogen concentration in plant tissue and topography: nitrogen concentration is greater at higher elevations than at lower elevations, and at the same elevation, the concentration is always greater on north-facing slopes.

12-3b Floristic Monitoring

LCTA is the ITAM component responsible for monitoring the flora on Fort Richardson. LCTA is the basis for much of the decision making for ITAM and other programs. LCTA was originally developed to identify land condition and vegetation trends on military installations. The methods were developed

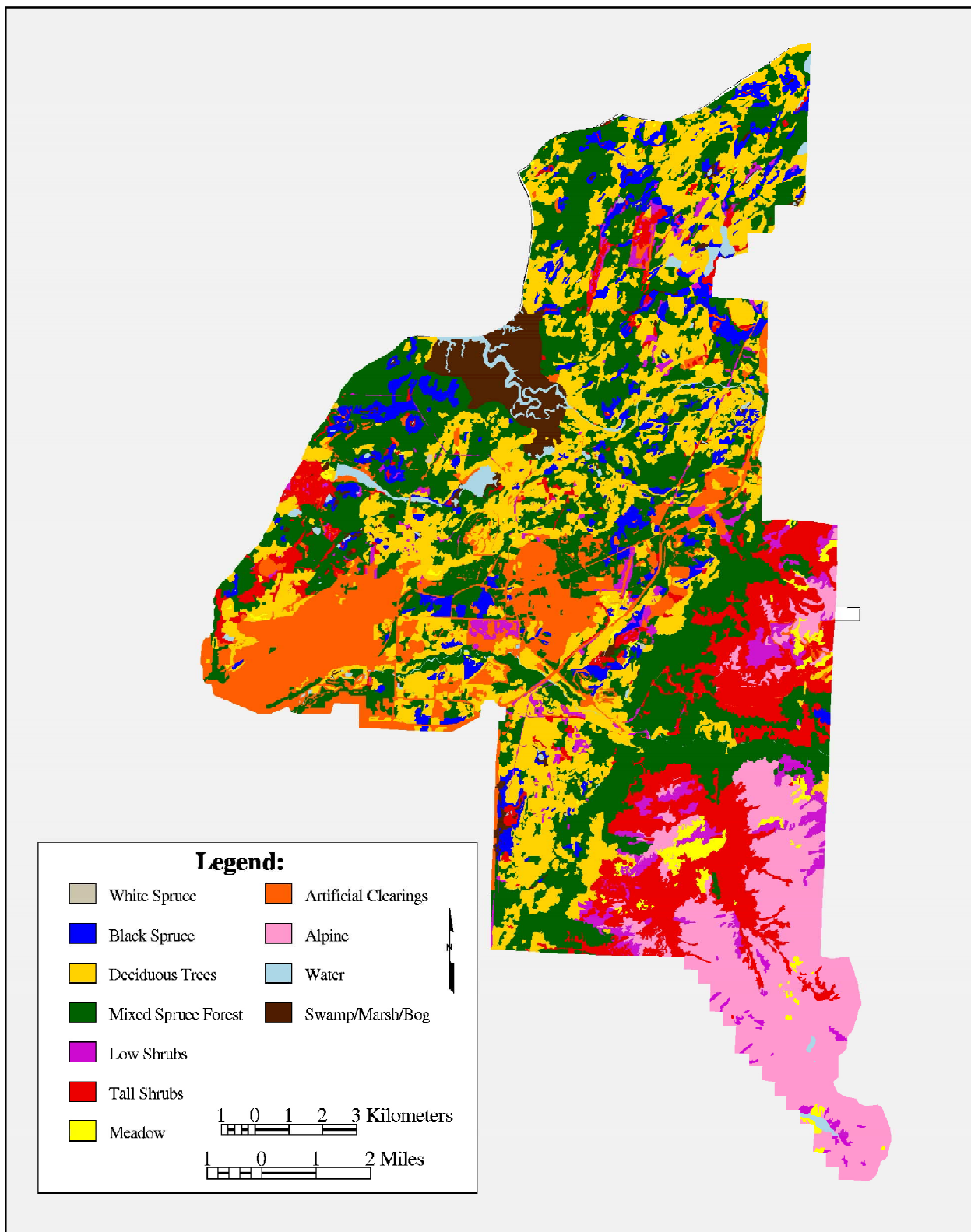


Figure 12-3a(8). Vegetation Map (draft version).

to provide installation-wide summaries of land use, disturbance, plant cover, vegetation communities, tactical concealment, birds, and small mammals.

12-3b(1) General LCTA Program Elements

The LCTA priorities are to provide information to support training first, and then to provide information for natural resource managers. LCTA data should be appropriate for projection onto maps (spatial data) to assist trainers in making decisions with regard to the LRAM (Section 14-11), and TRI (Section 13-3) ITAM programs.

Objectives, and perhaps data elements, should be standardized for LCTA, but site-specific methods should be flexible. Thus, LCTA has been modified to meet the specific needs of USARAK posts.

In order to interpret LCTA data and assist with predicting impacts, detailed information needs to be gathered on land uses at Fort Richardson according to management unit (i.e., land use by training area). This would include detailed training information (unit, class, and number of vehicles, dates, etc.) for each training activity within each training area. This process began at Fort Richardson in 1996.

12-3b(2) General LCTA Program Objectives

- ▶ Identify impacts on resources (spatial analysis) caused by trainers/testers and nonmilitary land users at various intensities (activity, frequency, and duration)
- ▶ Identify and prioritize areas that need rehabilitation to ensure sustainable training and testing
- ▶ Provide current predictive natural resources data that will affect decision making
- ▶ Provide information that may affect the structuring of forces and stationing of decisions at MACOM and DA levels

12-3b(3) USARAK LCTA Objectives

The primary goal of the ITAM program is to maximize military use of training lands, minimize land maintenance costs and damage caused to the environment, and effectively meet natural and cultural resources management requirements. Of the seven objectives developed for ITAM on Fort Richard-

son, the following are the primary responsibility of the LCTA program:

- ▶ Establish an environmental baseline inventory of the condition of natural and cultural resources on the training land
 1. Collect, compile, and update tabular data on species that occur on Fort Richardson.
 2. Store, compile, and maintain spatial data on the geographic information system
- ▶ Monitor and assess the condition of the environment in relation to training activities, natural causes, and other land use
 1. Monitor and assess long-term ecological and land use trends
 2. Determine training land status and capability for supporting military training
 2. Monitor and assess training area restoration
 4. Monitor erosion repair sites to assess restoration
 5. Monitor and assess effectiveness of habitat improvement projects both for vegetative and wildlife responses.

12-3b(4) LCTA Implementation

LCTA uses a wide array of natural resources data such as soils, ground cover, above ground vegetation/stem density, and disturbance types, to determine land condition and trends in that condition. Tazik et al. (1992) describe original procedures for LCTA plot inventory.



LCTA personnel monitor core plots.

LCTA was initiated on Fort Richardson in 1994 with 120 allocated core plots. Ninety-four were inventoried that year. Remaining core plots (26) were inventoried in 1995. All core plots were inventoried again in 1996, using original techniques. Results from the first three years indicate no significant short-term trends. Core plots were allocated using a GIS software package (Geographic Resources Analysis Support System, GRASS) which integrated soil series data and satellite imagery to produce a stratified random allocation. LCTA plots were well distributed on Fort Richardson with the exception of artillery impact areas (Figure 12-3b(4)).

Core plots are designed to be monitored intensively on a long-term basis. Frequency of intensive monitoring is dependent upon management objectives and amount of change occurring annually on the post. Plots will be monitored using the standard methodology once of every 5 to 10 years.

LCTA is being modified to determine training land status and capability for supporting military training. This methodology meets the second LCTA objective of determining status of training lands and providing the ecological information necessary to predict carrying capacity. Fort Richardson LCTA methods are being changed to work much like a forest inventory. In a forest inventory, homogeneous stands (polygons) are delineated across the forest. Non-permanent sample points are used to determine stand characteristics. This type of inventory is very spatial. LCTA uses the same concepts. Primary military land use (bivouac areas, maneuver areas, foot training, road right-of-ways, firing points, impact area, etc.) are delineated into polygons in every training area. LCTA plots are allocated in polygons that receive vehicular traffic (bivouac areas, maneuver areas, and firing points, but not road right-of-ways, which were measured differently). Plot inventories include ground cover, species composition, site rehabilitation prioritization, tree condition, and land use.

LCTA plots will be monitored annually using this modified technique (LCTA 2.0) during 1998–2003. The number and location of plots to be read each year will be annually determined specifically to meet the needs of Fort Richardson.

A small mammal survey associated with LCTA was conducted in August 1994, and a songbird survey was done in spring/summer 1994. LCTA methods were augmented with MAPS and Breeding Bird Surveys (BBS) programs.

In 1995, the LCTA effort included a survey of major lakes and McVeigh Marsh for water birds. The survey required about one week for a one-time survey of each area. It is not anticipated that this survey will be a part of the LCTA program in the future.

12-4 Inventory and Monitoring of Fauna

Traditionally, fish and wildlife management on Fort Richardson has emphasized species popular for hunting and fishing, especially moose, salmon, and trout. In recent years, significant strides have been made in nongame management. For the purposes of this plan, nongame is defined as species not hunted or fished on Fort Richardson. Inventory and monitoring (or census) are important to the entire Fort Richardson fish and wildlife management program.

12-4a Game Species

During 1998–2003, monitoring efforts for game species on Fort Richardson will emphasize moose and sport fish. Moose are monitored to ensure harvest levels are optimal for both utilization and protection of the animal. Game fish will be monitored to determine optimal stocking levels and interspecies relationships. Absolute numbers are seldom needed to manage game species if general trends are known.

12-4a(1) Moose

There is a considerable amount of ongoing research regarding moose management in Alaska. Some of the following information presented in this discussion of moose management on Fort Richardson was obtained from various sources that have studied moose extensively in Alaska. Much of this information is, as yet, unpublished.

Aerial moose surveys are critical for moose management. Surveys on Fort Richardson, Elmendorf AFB, and Ship Creek were initiated in the 1960s,

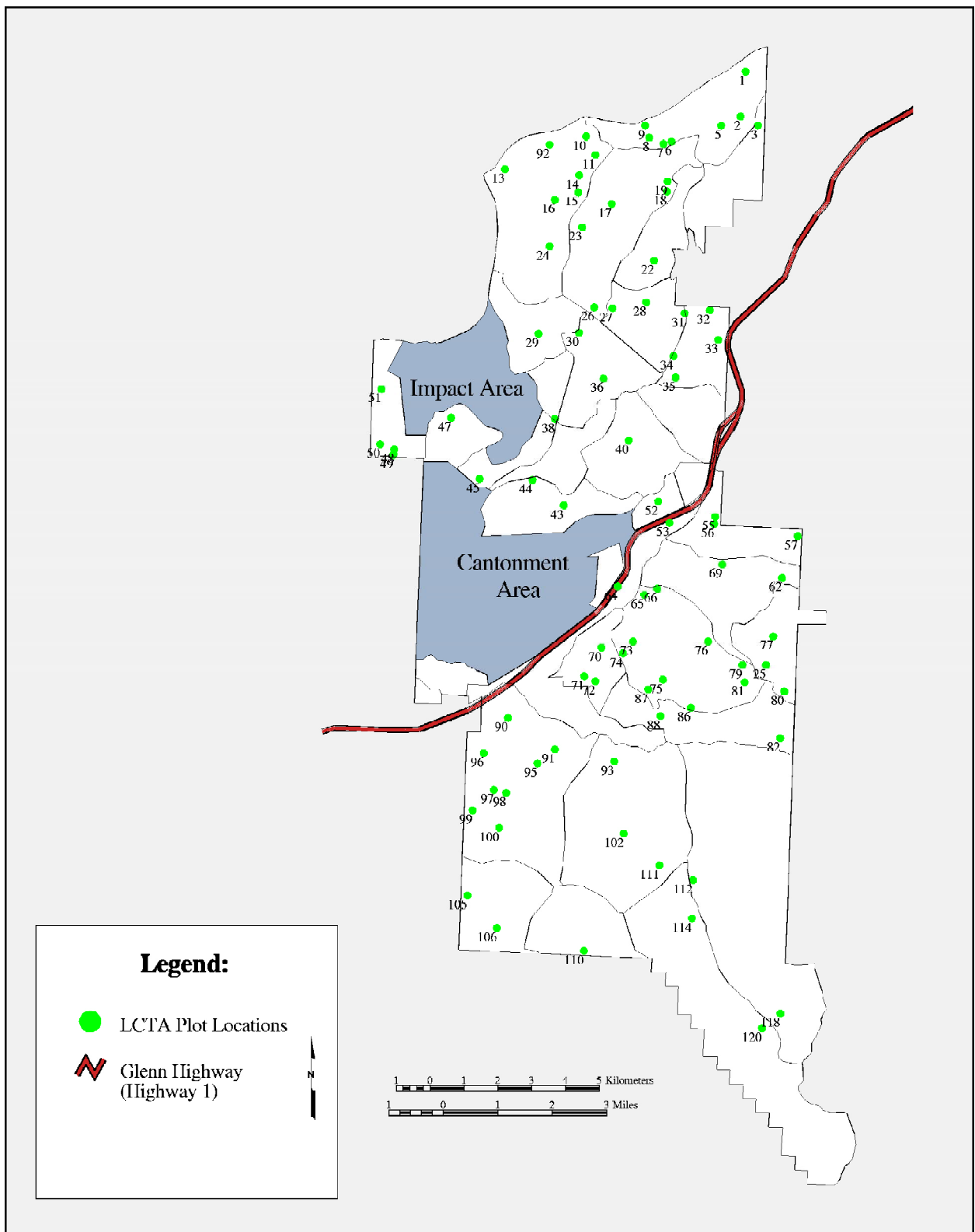


Figure 12-3b(4). LCTA Plot Locations.

but comprehensive written reports have been compiled only since the 1980s.

Typically, moose surveys are conducted in early winter (usually November) when snow cover is complete and light conditions are optimal. Surveys during past years were conducted from Army helicopters, later from helicopters flown by contracted pilots, and recently from two Super Cub fixed-wing aircraft flown by experienced commercial pilots under contract. One Super Cub carries a biologist/observer from USARAK and the other carries a biologist/observer from ADF&G. Approximately 90,000 acres are surveyed, requiring about 18 hours of combined flying time. Data is collected from intensive aerial observations in 14 survey units on Fort Richardson, Elmendorf AFB, and the Ship Creek drainage in Chugach State Park. Data includes the number of different-size bulls observed (small, medium, and large as determined by rack size), the number of cows, the number of cows with calves, and the number of lone calves.



During annual surveys of the Fort Richardson moose herd, every moose is individually counted.

An efficient way to monitor productivity, survivorship, and recruitment of moose populations is to determine trends based on the number of calves per 100 cows. The November census data for healthy, productive moose herds in Alaska with normal mortality rates typically show 20–40 calves per 100 cows. Herds with 40–60 calves per 100 cows would not only indicate highly productive herds, but also low mortality rates during the first six months of the calves' lives (calving on Fort Richardson takes place within a short period of time during mid to

late May). The Fort Richardson moose herd has shown relatively high numbers of calves per 100 cows in 1986 and 1987 (60 and 58 respectively) when there were no hunts, and substantially lower numbers during 1988 through 1993 (average of 35).

Information on relative herd size is obtained by using a Sightability Correction Factor based on an Intensive Plot Computer Model provided by ADF&G, which corrects for unsighted animals. Bull/cow and calf/cow ratios are calculated, as are percentages of cows without calves, cows with a single calf, and cows with twins. Annual reports (Quirk, 1993, 1996 and B. Quirk, 1994) are prepared, and this data is used to establish harvest limits, that USARAK and ADF&G personnel develop jointly. Data analysis follows procedures outlined in Gasaway et al. (1986).

Annual moose surveys will be continued during 1998–2003. To the greatest degree possible, the same survey protocols and personnel will be used to ensure continuity and accuracy of data. The survey techniques described above are appropriate for evaluating herd status, but they do not evaluate the quality of moose habitat and its relationship to moose numbers (carrying capacity). One objective for 1998–2003 is to evaluate the relationship between moose numbers and habitat carrying capacity and identify areas where habitat improvement is most needed.

The percentage of willow leaders browsed in a given area is one measure of moose numbers in relation to carrying capacity. This percentage should not exceed 90 percent, except during heavy snowfall years (Charles Schwartz, pers. com.).

During 1996 and 1997, a study was conducted to develop a diameter-mass relationship model to measure and predict utilization of willows by moose. The model will be used to estimate utilization of the two most common willow species browsed by moose. These site specific estimates of browse utilization will enable USARAK biologists to identify discrete areas to be targeted for habitat rehabilitation. The application of the browse utilization model in the USARAK GIS in combination with other data layers (vegetation map, soils, topography) provides a powerful tool for the future management of moose

habitat and the planning of habitat improvement projects.

The annual moose harvest offers excellent opportunities to collect field data. Military game wardens will check each hunter-harvested moose, document its location on a large scale map, determine sex, and if a bull, its rack size (small, medium or large). Data will be provided to the Natural Resources Branch.

Current research on habitat requirements of moose and the carrying capacity at Innoko National Wildlife Refuge, Alaska (Bob Skinner, personal communication), might be helpful to wildlife managers at Fort Richardson. A “bulls-eye procedure” has been developed, which uses a GIS to evaluate habitat in concentric circles around moose locations to define critical habitat (for example winter habitat). Innoko biologists also are developing a “habitat cookbook” to translate land cover data into habitat in terms of moose numbers. There also are ongoing studies to monitor browse use (percentage of leaders browsed) to develop habitat carrying capacity models. USARAK biologists will remain informed on these research projects.

12-4a(2) Small Game

Data on the harvest of small game is incomplete and not particularly indicative of population sizes. Beginning in 1998, hunters will be required to report their daily small game harvest to MPs at the Main Gate. This will provide information to help understand trends in small game populations. This data will be compiled and analyzed by USARAK Natural Resources Branch personnel.

12-4a(3) Sport Fish

USARAK Natural Resources, with assistance from ADF&G, will monitor sport fish on Fort Richardson. Most of the freshwater lakes need to be stocked with sport fish to support recreational fishing (Section 14-8b). Correct use of this management tool requires information on fish growth rates, survivability, and inter species relationships.

During 1998–2003, USARAK will, in coordination with ADF&G, conduct a 1 to 2 year monitoring program of Fort Richardson lakes. Monitoring will use protocols described in the *Lake Stocking Manual*

for Non-Anadromous Fisheries in Southcentral Alaska (Havens et al., 1994).



Test nettings of post lakes yield information on fish numbers and health.

12-4b Threatened or Endangered Species

Since fauna or flora surveys have not located any threatened or endangered species, it is unlikely that any such species would reside on Fort Richardson. There are no plans to survey for threatened or endangered species in 1998–2003 beyond looking for such species as part of other projects such as LCTA surveys. If new species are listed as threatened or endangered, or there is reason to believe that already listed species might be on Fort Richardson, then USARAK will take appropriate steps to survey for them.

12-4c Neotropical Birds

Recent nationwide concern over declining numbers of many neotropical birds sparked USARAK’s interest in collecting information on the status of these birds. If the data indicates that a management plan is needed for these species, one will be developed toward the end of the 1998–2003 five-year period.

USARAK is using three techniques to monitor neotropical migrants: LCTA plots, BBS, and MAPS. The survey descriptions have been taken from Roush and Andres (1994) and Andres (1995). Surveys are being conducted by the USFWS, CEMML, and volunteers.

The standard of using 60 LCTA plots for breeding bird surveys has been modified to 40 plots for use

at Fort Richardson. In 1994, 20 of these plots were surveyed. In 1995, 35 plots were surveyed, and in 1996 and 1997, 39 plots were surveyed. All surveys were conducted by USFWS personnel with the bulk of the work being conducted in the month of June.

Two BBS routes were established in 1994, a 50-stop route on the north post and a 30-stop route on the south post, including the Arctic Valley area. Both routes were surveyed each year, from 1994 to 1997. The BBS routes have been surveyed by USFWS personnel and volunteers, and are always conducted between 10 through June 20.

MAPS is a long-term, nationwide study designed to quantify demographic patterns in migratory bird populations. This information will help USARAK determine its needs for a neotropical bird management plan. In 1994, two MAPS stations were established, one on the south post at Bunker Hill, and one on the north post along the northeastern shore of Otter Lake. The station at Bunker Hill was abandoned in 1995 due to vandalism, but the station at Otter Lake has been monitored each year since 1994. The final year of study will be 1998, satisfying the criteria of five consecutive years of data. At MAPS stations in Alaska, mist-netting and point counts are conducted during June and July to monitor productivity and survivorship in the local breeding bird populations.

Because the three projects outlined above are limited in their coverage of potential bird habitats on Fort Richardson, a specific bird checklist survey (atlas survey) is also being conducted. This atlas survey is designed to determine species distribution and abundance on a base-wide scale. In this survey, biologists systematically search the post for bird species throughout the months of June and July, following the methods of Andres (1995).

In 1995, a five-day survey of lake and stream areas was conducted to complement the atlas survey of birds for Fort Richardson. A complete survey of lakes and ponds for waterfowl species was conducted in late April and May, 1996 and 1997. In addition, in March and April 1997, specific (night) surveys for breeding owls were conducted.



Radio tracking of bald eagles was part of the study being conducted on ERF.

This overall bird checklist project will continued in 1998–2000 until post personnel believe nearly all bird species that use the post have been recorded. This should occur by the year 2000 at the latest.

12-4d Waterfowl and Other Bird Surveys

The ERF contamination issue resulted in a great increase in survey efforts, particularly for waterfowl, shorebirds, bald eagles and other avian species associated with ERF¹⁸. Surveys of this important area on Fort Richardson will continue during 1998–2003, as required for monitoring and remediation efforts on ERF. Results will be recorded in memoranda and electronic databases.

In recent years, at least three other ground and aerial surveys for birds have been conducted beyond those described in Section 12-4c¹⁹. These surveys focused on lakes and wetlands to document waterfowl (especially breeding pairs), shorebirds, ravens, raptors, and other species. These surveys will be continued through 1998-2003.

The USFWS conducted the first systematic waterfowl surveys on Fort Richardson in 1996 and 1997 as part of a Legacy project. Lakes and ponds were surveyed for the presence of loons, grebes and other waterfowl during the spring migration. Results of this survey will be used to determine additional monitoring needs for water birds.

¹⁸ Memorandum for the record (30 Sep 90, 5 Oct 90, 8 Oct 90, 9 Oct 90, 10 Oct 90, 15 Oct 90, 22 Oct 90, 8 May 91, 9 May 91, and 13 May 91) are examples of results of these surveys.

¹⁹ Memoranda for the record (26 Apr 93, 25 Apr 94, and 9 May 94) by Bill Quirk.

A 1994 USFWS raptor inventory on Fort Richardson (Schempf, 1995) identified six different types of raptors: bald eagle, golden eagle, northern harrier, red-tailed hawk, Harlan's hawk (dark phase of red-tailed hawk), and sharp-shinned hawk. Although no goshawks were found during this inventory, they are known to inhabit the forested areas of the post. The 1998 vegetation map will be used to pinpoint likely habitat for goshawks and intensive ground surveys will be conducted in those locations.

The USFWS conducted the first intensive owl surveys on Fort Richardson in 1997 (Browne and Andres, 1998). Three species of owls were identified: great-horned, saw-whet and boreal. The boreal owl was the most common species with nine birds recorded. Seven great-horned and six saw-whet owls also were recorded.

A long-term raven study begun in 1994 by ADF & G is still being conducted. Further information can be found on this in Section 14-7.

12-4e Other Wildlife Species

During 1995–1996, ADF&G conducted a furbearer study on Fort Richardson with an emphasis on coyotes and the relationships between predatory furbearers and snowshoe hares. In addition, they are currently involved in an ongoing black bear study with Elmendorf AFB and Fort Richardson. These studies are described in Sinnott (1995).

Occasional special aerial surveys have been conducted for marine mammals, waterfowl, brown bears, Dall sheep, wolves, raptors, and other species²⁰. These informal surveys will continue on an opportunistic basis in 1998–2003. Results will be documented using memoranda and electronic databases.

A small mammal survey was conducted in summer 1994. Protocols for this survey were established in the LCTA Manual. The survey was not intensive enough to include all important habitats, but did result in a Checklist of the Mammals of Fort Richardson, Alaska prepared by Cook and Seaton (1995). The small mammal survey will be repeated in a more comprehensive manner to include all important habitats during 1998–2003.

Amphibian population declines and reports of amphibian deformities worldwide over the past decade have raised concerns over the status of the wood frog (*Rana sylvatica*) in Alaska. To date, little work has been done to determine the current wood frog population in the southcentral region. An Alaska Pacific University graduate student and the Alaska Natural Heritage Program (ANHP) have initiated a volunteer-based amphibian monitoring study to determine where the frogs live, their baseline populations, and the timeline for their breeding season. The USFWS has proposed a more in-depth mark/recapture study to be performed on Fort Richardson if funding and personnel become available.

Depending upon the results of on-going surveys and the need for additional information, USARAK may intensify study efforts for some of these species during 1998–2003.

12-5 Monitoring Water Quality

Monitoring water quality is important for measuring ecosystem health at Fort Richardson. Land-based environmental degradation eventually affects water quality and the aquatic ecosystems dependent upon it.

12-5a Surface Water

There is no evidence that surface waters on Fort Richardson are polluted significantly, either from activities on the post or in upstream areas off the post. There are, however, significant restrictions on use (related to recreational and military training) in areas near lakes and streams to reduce the potential for pollution, including sedimentation. For these reasons, there will be no regular monitoring of surface waters. However, if any reason should arise to suspect surface water quality problems during 1998–2003, then regular monitoring of water quality will be initiated.

12-5b Groundwater

Groundwater is one of Fort Richardson's most valuable natural resources. Monitoring groundwater was emphasized after the post was placed on the National Priorities List in 1994. The resulting Federal

²⁰ Examples include Memoranda for the record (15 Aug 92, 25 July 93, and 13 Oct 93) by Bill Quirk.

Facilities Agreement has commitments from USARAK to monitor this critical resource.

As a result, USARAK has installed about 100 monitoring wells over the years. Groundwater levels in the wells are monitored each month, and extensive chemical testing is conducted on a quarterly basis. This program is important to natural resources management, but is not considered a natural resources function. On Fort Richardson, it is a responsibility of the compliance and/or restoration program, and therefore details of this program are not included within this INRMP.

The monitoring efforts indicate that there are no significant levels of groundwater contamination at Fort Richardson. What little contamination that has been detected is at very low levels and is of no threat to human health. Monitoring will continue in 1998–2003 as part of programs implemented by the ERD.

12-6 Storage and Analysis of Digital Data

Natural resource digital data is managed within USARAK's GIS computer system. The GIS utilizes state-of-the-art computer technology for efficient storage, retrieval, and analyses of digital data. The USARAK GIS is a network of digital databases that have been built to support administrative and management objectives affecting natural resources, environmental restoration and compliance, training lands, and post infrastructure.

In addition to increasing the GIS database with digital data from hard copy map sources, the GIS also contains digital aerial photography and satellite imagery. Output GIS products include hardcopy maps, statistical information, and a user interface that allows access to on-line digital databases for display and/or query purposes. USARAK is also developing user interfaces to display, query, and create map information from their desktops.

12-6a USARAK GIS–Natural Resources Digital Database

Development of the GIS database for Fort Richardson is in progress. CEMML and CRREL are helping to provide data. In addition, USARAK has both

a GIS Technician and an Analyst who develops appropriate data layers. These two personnel provide GIS support to all three USARAK posts. Appendix 12-6a lists current and projected digital data layers for Fort Richardson.

12-6b USARAK GIS Applications

USARAK GIS is used to support numerous mission objectives. Under the ITAM program, the GIS will be applied to support the optimum, sustainable use of training lands, support inventory and monitoring of land condition, provide analyses for integrating training requirements with land capacity, assist trainers in minimizing adverse impacts, and provide analyses for land rehabilitation and maintenance. The GIS will incorporate field plot data and global positioning systems (GPS) data on land characterization in the LCTA program. GPS data also will reside in the GIS for applications within the LRAM program (e.g., to determine the extent of erosion on roads within training areas).

GIS analyses will provide a variety of maps for trainers to use such as trafficability, corridor planning, antenna siting, and can assist in overall military mission planning. Output products include a customized user-interface for trainers that will allow them to display map features and/or produce maps of environmental considerations in training areas they wish to use. Map features can include, but are not limited to, training areas, firing fans, ranges, drop zones, helicopter landing zones, transportation networks, drainage, impact areas, cultural sites, vegetation, wetlands, and elevation.

GIS analyses will be used to support natural resources management. During 1998–2003, the GIS will be used to evaluate training impacts on natural resources. This type of analysis will help prioritize projects for natural resources management. As LCTA data is collected and analyzed in the GIS, military training impacts on natural resources will be quantified.

Other GIS applications for natural resources management include mapping wildlife habitats and determining watersheds, flood zones, and ecosystems. In addition, posts may have site-specific research areas which should be incorporated into USARAK

GIS. For example, CRREL has conducted years of research in the ERF Impact Area on Fort Richardson. Their resultant ERF GIS database will be incorporated into the USARAK GIS.

Within the Environmental and Compliance Branch, USARAK GIS applications support compliance and restoration mission objectives. Groundwater monitoring, hazardous materials management, and spill response programs are a few examples where GIS is being applied. CRREL is developing a compliance and restoration GIS database for all three posts.

USARAK GIS is an excellent tool that can support a wide range of administrative and management issues affecting each post. As the USARAK GIS network is consolidated, users will have access to selected databases to increase their efficiency in the decision-making processes.

12-7 Summary of 1998–2003 Inventory and Monitoring

- ▶ Implement Alaska Regional LCTA 2.0 and annually monitor plots and analyze results
- ▶ Annually collect Site Rehabilitation Priority/land-use data during LCTA surveys
- ▶ Annually update the floristic survey to include new species found during LCTA surveys
- ▶ In 1998, complete soils inventory
- ▶ In 1998, complete vegetation mapping
- ▶ Annually monitor moose herd size, distribution, and productivity
- ▶ Institute moose browse study
- ▶ Annually collect moose harvest data at check stations
- ▶ Annually collect harvest data for small game monitoring
- ▶ Continue black bear data collection and monitoring
- ▶ During 1998–2003, monitor Fort Richardson lakes for fisheries status
- ▶ Annually monitor neotropical birds using two MAPS stations
- ▶ Annually survey neotropical birds using two BBS routes
- ▶ During 1998–2003, update the bird checklist
- ▶ In 1998–1999, the USFWS will complete the water bird survey
- ▶ During 1998–2003, continue to monitor groundwater
- ▶ In 1998–2003, update computer hardware and software
- ▶ During 1998–2003, develop and maintain GIS databases
- ▶ In 1998, conduct LRAM inventory
- ▶ During 1998–2003, use GIS data analyses to support natural resources and other environmental programs
- ▶ Annually identify impacts on resources (spatial analysis) by trainers/testers and non-military land users at various intensities (activities, frequency, and duration)
- ▶ Annually identify and prioritize resource restoration, rehabilitation, and revegetation areas to ensure sustainable training and testing
- ▶ In 1998, develop military training map with environmental considerations
- ▶ Establish an environmental baseline of the condition of natural and cultural resources